

# ROCKS and MINERALS

*A Magazine for Mineralogist,  
Geologist and Collector . . .*



*. . . . . Official Journal of  
The Rocks and Minerals Association.*

**AUGUST, 1938**

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## THE ROCKS AND MINERALS ASSOCIATION

PEEKSKILL, N. Y.

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Organized in 1928 for the increase and dissemination of mineralogical knowledge.

To stimulate public interest in geology and mineralogy and to endeavor to have courses in these subjects introduced in the curricula of the public school systems; to revive a general interest in minerals and mineral collecting; to instruct beginners as to how a collection can be made and cared for; to keep an accurate and permanent record of all mineral localities and minerals found there and to print same for distribution; to encourage the search for new minerals that have not yet been discovered; and to endeavor to secure the practical conservation of mineral localities and unusual rock formations.

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Ever since its foundation in 1928, the Rocks and Minerals Association has done much to promote the interest in mineralogy. It has sponsored outings, expeditions, formations of mineralogical clubs and the printing of many articles that have been a distinct contribution to mineralogy.

Those of our readers who are members of the Association can rightly feel that they too were sponsors of these many achievements that have helped to give mineralogy a national recognition. Among your friends there must be many who would like to have a part in the Association's work—to share with you the personal satisfaction, the pleasure, and the benefits of membership. Will you give your friends this opportunity to join the Association by nominating them for membership? A nomination blank will be found elsewhere in this issue.

Each new member helps to extend the Association's activities—helps to make your magazine larger, better, and more interesting, and above all assists in the dissemination of mineralogical knowledge.

**Some advantages of membership:** All members in good standing receive:

(1) *Rocks and Minerals*, a monthly magazine. (2) A member's identification card that secures the privileges of many mines, quarries, clubs, societies, museums, libraries. (3) The right to participate in outings and meetings arranged by the Association. (4) The right to display a certificate of membership and to place after their names a designation indicating their membership or to advertise membership on stationary, etc. (5) The distinction and the endorsement which comes from membership in the world's largest mineralogical society.

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Mineralogical clubs which subscribe for *Rocks and Minerals* also become affiliated members of the Rocks and Mineral Association and enjoy all the advantages which such an affiliation affords.

A number of clubs hold membership in the Association, participate in the annual outings, and co-operate in many ways in furthering the aims and ambitions of the Association.

Affiliation with the world's largest mineralogical society cannot fail to increase membership, enlarge circles of acquaintanceship, and stimulate a keener interest in mineralogy.

A list of affiliated clubs will be found among the back pages of the magazine.

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# ROCKS and MINERALS

PUBLISHED  
MONTHLY



Edited and Published by  
PETER ZODAC

AUGUST  
1938

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ROCKS and MINERALS

PEEKSKILL, N. Y., U. S. A.

**The Official Journal of the Rocks and Minerals Association**

## CHIPS FROM THE QUARRY



PETER ZODAC

### TRUMBULL MINE PARK

One of the objects of the Rocks and Minerals Association is to secure the preservation of mineral localities and a maintenance of their accessibility for mineral collectors and geologists.

It is in like words but with a more general application that the story of the conversion of the old Trumbull Mine property into a public park, which is printed elsewhere in this issue of the magazine, begins. We commend the article to thoughtful reading by members of the Rocks and Minerals Association, and especially by the Mineralogical Clubs affiliated with us, for it illustrates what such groups can accomplish through intelligent co-operation with the public authorities in their towns, villages and cities.

While it was planned to take advantage of every resource the Trumbull Mine property afforded for pleasure, recreation and sport, in developing it for park purposes, it was the opinion of the good people of Trumbull that the minerals for which the old mine was noted, and the mine itself should not be overlooked, for it had been the mine and its minerals that had made the place noted at home and abroad and, through the years, had attracted people from far and near to Trumbull, Conn. To neg-

lect the mine, would be to refuse to recognize one of the most important features of the property.

With this thought in mind, the Long Hill Mineralogical Club of Trumbull was invited to co-operate with the Town's Selectmen and Park Commissioner. How successful this co-operation proved to be is too well told in the story itself to be dwelt upon here. But it is to this successful co-operation we wish to direct attention. Also we wish to join with countless mineralogists and geologists in thanking the good people of Trumbull, their Selectmen and Park Commissioner and the members of the Long Hill Mineralogical Club for the preservation of the old Trumbull Mine and the privilege which is to be accorded all collectors to take from it such specimens of its minerals as may still be available in the old dumps and workings.

In these days of park developments and the opening of new or the widening of old roads, many geologic and mineral formations are either overlaid with cement or otherwise obliterated which might be of interest to geologists and mineralogists.

In the widening of a road in a rural section of our township, an unusual dike formation was laid bare. Although there was no danger of crumbling or loose rock falling upon the road surface, the dike and the rock with which it was associated were promptly covered with cement. The dike could have been an object of preservation for geologists. Now it is lost.

Of course quarrying out specimens from a roadside could not be tolerated. It is too bad, however, that there could not be some one in such working groups who could detect such occurrences and see that they are preserved for observation purposes.

*Peter Zodac*

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WHOLE NO. 85

## MINERALOGY AND THE BLOWPIPE ART

H. R. LEE

AN ADDRESS TO NEW YORK MINERALOGICAL CLUB, MAY 18, 1938.

### History of The Blowpipe Art

The delicacy and perfection of soldered and welded joints in pre-Christian jewelry bear silent witness to the skill with which the artificers in gold and silver used the jeweler's blowpipe. From the joining of two reeds having tuyere of clay perforated with a needle the blowpipe has grown to present perfection, and most of the improvements have been made by the long line of Swedish and German mineralogists who have kept the device our scientific property since the first borrowing from the jeweler's bench about 270 years ago. However, our practice of the blowpipe art may well hold alliance with the jeweler's craft, for he still uses gear of peculiar kinds that we shall always require. Needing blocks of close-grained willow charcoal that the chemical dealer no longer supplies—for the blowpipers are few and come seldom and spend little—I repaired to Dutch Street, a thoroughfare in New Amsterdam even older than the blowpipe art. In a ware-room there purveying to the needs of jewelers and silversmiths I found charcoal of the finest, and the utensils there displayed left no doubt that the jeweler's bench is ancestral to the blowpiper's table.

The ensuing historical search brought results worthy of submission to this audience. Earliest reference to scientific use of the blowpipe in Europe is found in a pamphlet on Iceland spar, published in Latin in 1670 by a German, Erasmus Bartholin, who mentions that the mineral

proved capable of calcination to lime by the blowpipe flame. In a book published nine years thereafter, also in Latin and entitled the **Experimental Glassblowing Art**, the German J. Kunckel suggests that the glassblower's table could serve the chemist in many ways, notably in the blowpipe reduction of metallic oxides on the charcoal block. In 1739 there appeared, again in Latin and entitled **Elements of the Testing Art**, a work by another German, Johann Andreas Cramer, wherein he describes a blowpipe of copper tubing, fitted with a hollow sphere for retention of moisture from the breath of the operator, and suitable for the fusion of small beads of metallic or other materials. By that time blowpipe workers had found the operation arduous, and for 150 years thereafter hardly a decade passed without appearance of novel mechanical means for the production of blast. Some of those devices have merit for laboratory use, but they impair the portability that the blowpipe kit should always preserve.

From 1740 well into the 19th century all recorded development of the blowpipe art took place in Sweden, where a succession of distinguished men made it the basis of the remarkable advances in mineralogy and chemistry for which that country and the period are famous. In 1738 Anton Schwab, of the Swedish Bureau of Mines, first applied the art to the testing of ores, but he left no written record. Cronstedt, who used the blowpipe chiefly to identify the elements in

minerals, was first to recognize that borax, sodium phosphate and soda are distinctively colored by many of the oxides that these salts variously flux. He furthermore standardized the essential utensils and reagents, constructed the first portable kit, and called it the pocket laboratory. In a book published in 1770 Engestrom collated the mineralogical researches of Cronstedt, and he added an introduction to blowpipe analysis—the first comprehensive description of the art. Bergmann, professor of chemistry at the University of Upsala, checked and broadened the methods of Cronstedt, improved the form of the instrument, and in 1779 published all methods in a **Commentary on the Blowpipe**. In 1784 Scheele announced the operating difference between the oxidizing and reducing flames. However, publication was soon again outstripped by knowledge in the accomplishments of Gahn, whose distinguished work developed all fundamentals for use of the blowpipe in chemistry and mineralogy. In addition to his remarkable skill Gahn devised, among other improvements to the art, use of the platinum wire for support, of cobalt nitrate as a coloring reagent, and of soda for reduction of oxides. Inasmuch as he wrote nothing, preservation of the methods and results is due to his pupil Berzelius, who in 1812 made them a section of the first edition of his **Text-book of Chemistry**. Indicative of Gahn's skill and Berzelius' admiration the latter relates that his master demonstrated by blowpipe art trace of copper in ash from a tree grown on the Koppaberg. That mountain contains the famed Swedish mine of the name, which was incorporated in 1347 and is still producing. Pursuing the art with enthusiasm and affection Berzelius in 1820 published the famous monograph entitled **Use of the Blowpipe in Chemistry and Mineralogy**, which reached four German editions and was elsewhere widely translated. Here ends the Swedish saga of the rising young art.

Meantime in France de Saussure and Le Baillif and in England Smithson and Turner skilfully used and taught the

blowpipe, but time permits mention only.

Long before the book of Berzelius had appeared in German print the blowpipe art had figured prominently in mineralogical, metallurgical and chemical instruction at the famous Mining Academy in Freiberg, Saxony. The new textbook assisted instruction, and it stimulated research by Plattner and Harkort, who were students and contemporary teachers there. Being skilled in the quantitative fire assay of the precious metals, and withal imaginative, Harkort adapted the silver assay to the reduced scale that the blowpipe permits, and in 1827 he announced the new method in a monograph entitled **The Art of Assaying with the Blowpipe**. As compared with the furnace method the blowpipe assay saves much time, but the result is less accurate by reason of the small weight of ore that the flame can work—0.1 gram instead of 29.166 grams, which is the accepted Assay Ton. Within the next 20 years or less Plattner had adapted to blowpipe scale the methods for furnace assay of gold, copper, lead, bismuth and tin, and he had devised a method of surpassing neatness for the successive assay of iron, cobalt, nickel, copper, silver and gold from a single specimen of the cobalt-nickel speiss then smelted nearby.

In the same decades Bunsen, who was chemist rather than mineralogist and inventor of the burner that bears his name, devised and published his methods for detection of elements by their coloration of the Bunsen flame. While the technique was new, flame coloration was not; though convenient in the laboratory, the Bunsen burner can not serve the prospector in the field. More importantly Bunsen devised the blowpipe method of distilling volatile elements to fumes capable of deposition as films which comprise oxides, sulphides and iodides, many of them highly colored and strongly characteristic. Through complete correlation of elements and colors Bunsen made to the blowpipe art the last fundamental gift that it seems likely to receive. Justice requires mention of Kobell, who proposed the familiar series of seven minerals still accepted as the scale of fusibility for

mineralogy.

Our historical survey of the inventive period warrants at least one conclusion not always recognized—that mineralogical science and the blowpipe art grew up together.

Cessation of invention in the art since 1850 means only that it had been developed to a finished tool adequate to the needs of chemistry and mineralogy as then practiced. The continuing lack of invention means that by about 1900 chemistry had outgrown need of the blowpipe and that mineralogy then began to use additional tools—first the microscope and later the X-ray. Until about 1870 the usual laboratory manual of chemistry described qualitative analysis both in dry and wet way, giving emphasis to the speed of the blowpipe in preliminary examination. By 1900 the blowpipe methods were only mentioned as occasionally useful. Under the wet method the chemist separates all of each element as he proceeds, while the blowpipe must test for each one in the presence of others, frequently against their interference. Although chemistry grew up on the blowpipe, the desertion is final and by no means regrettable.

On the other hand the utility of the blowpipe art to determinative mineralogy is evident from the trend of teaching and publication from 1850 until recent years. Mineral determination—but not chemical analysis—by the blowpipe is still taught to students in mining and metallurgy because they may need it—the miners as producers and the metallurgists as users of minerals. Throughout the 80 years since the death of Plattner the outflow of textbooks on determinative mineralogy in connection with the blowpipe has been continuous, and the quality of succeeding editions has always improved. At least until 1900 his successors at Freiberg, Richter and Kolbeck, issued frequent and improved editions of his *Art of Testing with the Blowpipe*—a work in which blowpipe determination and assaying have always been treated in wise proportion. For lack of equivalent text in this country at the time Cornwall, of Columbia University, published in 1872 an excellent

translation, which was procurable through several editions for about 40 years. Limiting mention to works on determinative mineralogy that emphasize blowpipe methods and provide determinative tables therefor, we find that between 1880 and 1930 Brush—later Brush-Penfield—of Yale, Egleston and then Moses and Parsons of Columbia, and Lewis—later Lewis and Hawkins—of Rutgers, have in turn produced excellent books in frequent editions.

A survey properly perspective of the blowpipe art must include the late Adrien Braly, who in 1927 published in French the only edition of the *Determination and Study of Ores*. Having only 300 pages the work is less compendious than Plattner-Richter, but it is well condensed for the mining engineer and prospector needing determinative mineralogy and the blowpipe assaying of gold and silver in one book. Having travelled far and often in both capacities the author, versed in mineralogy and skilled with the blowpipe, reached mature conviction, against much dissent, that the frontier and the waste spaces still remain, that the airplane has not cancelled space, that ores can still usefully be determined in the field, and that the blowpipe kit holds the answer. Having said this for Braly I have spoken for myself. Although he has not added to the fundamental inventions that ceased with Bunsen, Braly has devised far neater technique and equipment for some of the usual tests, and special methods for the rare minerals that have lately reached commercial demand.

The space to this point given the history of the blowpipe art is warranted by corresponding neglect in the textbooks, but in deeper sense I am actuated by reverence for the pioneers of mineralogy who have passed the flame down to us. Who would be great must first respect the great.

#### **Present Interest of Blowpipe Methods**

The metallurgist likes the blowpipe art, probably because it permits him to play with fusion, volatilization, oxidation and reduction in a coal, clean way impossible in large operation. By reverse reasoning blowpipe practice has great in-

introductory value in teaching metallurgy, especially to the student who may never have seen liquid metal. Whether in glass or in flame, every blowpipe reaction proceeds in full view, capable of interruption, examination and resumption, all at will. Most industrial furnaces are tightly closed, and internal conditions must be largely imagined.

The blowpipe reduction of litharge to lead reveals the transition of oxide to metal and the reducing power of carbon monoxide, the domestic gas that burns blue—and sometimes burns pancakes. The blowpipe flame reduces the oxide of lead freely, of copper easily, of zinc and tin hardly, of nickel possibly, and of iron and cobalt not at all—and the impressions gained check with later experience. Of the blowpipe fluxes borax dissolves iron ore or lime, while soda does not; soda or borax dissolves quartz, but phosphate of soda does not; the reasons are chemical, and the young metallurgist, being a fire-chemist, observes and appreciates, and he correctly concludes that a mixture of soda and borax should flux most minerals. By the pyrometer the blowpipe flame has a hot spot around 1400°C, and the curious student tries it on minerals in wide variety. Blast furnace slag high in lime resists, but the kind high in silica softens; one kind of asbestos stands up, but the others fuse; a simple silicate like fayalite shows a sharp melting point, but a complex silicate like glass exhibits a long softening range. In blowpipe assaying an arsenical silver ore poorly roasted leads to arsenical work-lead that can not be scorified, and a liquid button of such lead divides for want of surface tension. Poor roasting of chalcopryite leaves sulphur, and recovery of copper is low. Research methods are based on the belief that it is far cheaper to learn metallurgy by the gram than to spoil metals by the ton.

Not to labor the theme or belabor the audience, I owe most of the foregoing reflections to a leader in metallurgical education and an artist of the blowpipe, Dr. Joseph W. Richards, who studied them both at Freiberg under Richter and Kolbeck just 50 years past. Not quite that many years ago I studied both under

Richards at Lehigh University, and through him my love for the blowpipe derives from Harkort and Plattner through the line who successively learned, then taught, the ancient art. It is most agreeable to learn that blowpipe courses equal to the best of any place or time are still offered at Heidelberg University by the Victor Goldschmidt Institut für Krystallforschung, which is named for one who was fellow-student at Freiberg with my preceptor.

\* \* \*

To deserve further thought by this audience the present interest of the blowpipe art must rest on whatever value and pleasure it may add to your future study of mineralogy. Inasmuch as the art is now used only for the identification of minerals, the charms of determinative mineralogy must next be set forth in alluring array of the utensils to be bought, the tests to be made, the colors to be seen, and the facts to be learned.

Anyone who loves gadgets will adore a blowpipe kit, and although many of the utensils are needed to make a beginning the later purchase of about four times as many may pleasantly be spread over a number of years. After owning a kit for 33 years I added last week a pycnometer costing 80 cents and a graduate on which an additional dime was squandered. Needing neither gas nor running water, the table—by choice an antique of Michigan mahogany coeval with the horsecar—should occupy best light in a good room, preferably where the odors of hot paraffin, sulphur dioxide, and fume of arsenic will be most highly appreciated.

Regaining dignity—tests of the wide variety yet to be described constitute a search having full flavor of the detective art, wherein the mineralogical sleuth hound, or rock hound, successively observes, deduces, arrays evidence and draws conclusions, all with rapidity amazing—often in the utter lack of validity. However, along the way bead, flame and film will have delighted the eye with colors in variety and brilliance reminiscent of Joseph's coat, the glory of Solomon, the Easter Parade, and the

municipal fireworks—and even tints not yet used in feminine apparel are often observed.

Returning to cultural concerns, the identification of any half dozen specimens will require application of principles in crystallography, physics, chemistry and metallurgy, and those curious of their names will acquire the considerable knowledge of Greek and Latin roots that dictionary search readily conveys. However, mistakes have been made, for pyroxene is not a "stranger to fire", being one of the minerals most common in the basic igneous rocks.

#### **Blowpipe Utensils and Their Uses**

The blowpipe art can be taught only at the table, so we can now attempt only swift survey of the equipment, and then of the tests made and things seen.

Since Cronstedt first arranged the utensils in his pocket laboratory the blowpipe kit has retained the compact and portable form needed by the prospector. Every kit sold is assembled in a box partitioned suitably to the contents and built strongly enough for travel. Even those who bring minerals to the kit will find value in orderly assembly, and the box should contain only those articles that could be carried afield. This limits the reagents to dry salts and acids, but the home table can usefully offer liquid acids and ammonia.

The flame to which the blowpipe gives form and chemical quality should be that of the common candle, and paraffin, beeswax and tallow are named in preferred order. The paraffin candle can not spill, it retains form in hot climates, it is free from sulphur, and it can be had the world over. Containing 85 per cent. of carbon in purely hydrocarbon form, it excels city gas and alcohol in both reductive power and high temperature—qualities required in high order for difficult reductions and for reaching 6 in the fusibility scale. The flame of the blowpipe impinges on minerals supported variously by the charcoal block, the plaster slab, the platinum forceps, and the platinum loop. Willow charcoal has best strength and density, and the mineral rests in a shallow pit swept by flame.

The plaster slab has similar form but special use, inasmuch as white excels black in giving true value to such colored fumes as may distill from the mineral and spread over the surface. The platinum forceps hold a splinter of mineral in the path of the flame, chiefly for measure of fusibility but also for such coloration as the flame may receive. The platinum loop holds a lens, called a bead, of fused salt—borax, sodium phosphate or soda—to which color may be given by powdered mineral fluxed into the bead by the enshrouding flame.

The alcohol blow-lamp provides smokeless flame hot enough for fusions in the platinum spoon and tests made in glass, and the fuel is available to every prospector having adequate medical supplies. Of the glass supports the matrass, or closed tube, about three inches in length, is closed at one end when drawn from slender tubing of soft glass. It provides heating of mineral powder with least contact of air, and each serves only one test. The open tube, about four inches long, is cut from larger tubing of hard glass. It permits roasting of mineral in air under natural draft, and reuse is possible. Platinum wire wetted with acid, dipped into powdered mineral, and brought over the alcohol blow-lamp yields flame coloration according to which of eighteen elements the specimen may contain.

#### **Typical Blowpipe Tests in Determination of Minerals**

One-half of the typical blowpipe tests employ flame with air—the two agencies together so potent to change matter that they were termed elements from the Grecian dawn of natural philosophy to the birth of modern chemistry.

Being a muffle of small size the closed tube distills mineral powder almost in absence of air. In it the zeolites, familiar to those versed in the minerals of New York City and its environs, yield combined water, which condenses in a visible ring higher in the tube. Water is likewise distilled from gypsum, but not from anhydrite, and this test forms simplest way of telling the two apart. Cinabar, the red mineral of mercury, distills

without decomposition to a black ring, which when rubbed becomes red again. Pyrite yields one-half of its sulphur to a yellow-red liquid that solidifies to the yellow element. But arsenopyrite stages the best show, forming successive rings of gray arsenic, black arsenic, yellow-red sulphide and the white oxide.

Operating as a roasting kiln with liberal supply of air the open tube oxidizes minerals containing sulphur, arsenic, antimony, selenium and tellurium, yielding for each a characteristic odor or an oxide film on the glass, and in most cases both. Cinnabar gives the sulphurous odor and coats the glass with a mirror of mercury.

The charcoal block is a hearth furnace, where the charge rests on a carbon lining and is hooded with flame. Under oxidizing conditions it yields from appropriate minerals ten fume coatings, four of them white and six colored. To produce the nine corresponding iodite films, which have colors different and more intense, the roasting is repeated with mineral powdered and mixed with bismuth flux. To improve brilliance of hue colored films should be reproduced on the white background of the plaster slab. Under reducing conditions and without aid of fluxes minerals of lead, bismuth, antimony, copper, silver and gold yield the metals in fused buttons.

The coloration of flame by powdered minerals borne on the platinum wire, already described, identifies eighteen elements, of which nine yield greens, four blues, three reds, one violet, and one yellow—and the shades are easily remembered. Although the hand spectroscope is recommended by one author as an aid in analyzing colored flames, those reasonably low-priced present a spectrum too short to orient a given line. Worse yet, most minerals contain elements that are not parts of the typical analysis, and the incidental lines divert attention from the essential.

The remaining one-half of the typical blowpipe tests use flame with fluxes. As compared with borax the sodium phosphate bead yields colors weaker but in greater variety of shades. In both beads the characteristic colors are given by

eleven elements, all of them metals, six common and five rare. Of the six common metals chromium gives green, cobalt and copper blues, iron yellow, manganese violet, and nickel red. Although approximately true, this simple statement does not attempt to define the extent to which the six metals yield variant colors according as their concentrations in the beads may be high or low and as the oxidizing or reducing flame may be used. Worse yet, natural minerals are rarely pure, and when two or more of the coloring elements occur together the production of mixed shades and the possible masking of one color by another greatly impair reliability of results. Furthermore, the colors given by the five rare metals are weaker and therefore more sensitive to such conditions and interferences. However, under a stated set of conditions an element usually gives different colors or shades to the two fluxes, and this fact gives reason and obligation to try any specimen in both. Although the colors yielded by the eleven metals when pure are well tabulated for concentrations high and low, and for flames both oxidizing and reducing, serviceable skill can be had only by much patient practice. So, except in practiced hands the bead tests are generally considered the least reliable of all blowpipe methods. The phosphate bead enables quick recognition of a silicate, inasmuch as the melt dissolves all oxides other than silica, which remains in the flocculent form termed the silica skeleton. In the same bead free silica retains full form and sharp edges.

On charcoal soda fluxes and thus aids difficult reductions, and the pulverized oxides of tin, nickel and cobalt are there reduced to metallic powders. Identification of a sulphate—gypsum for example—requires reduction to a sulphide soluble in water, and soda produces a melt that when wet blackens silver. Cobalt nitrate is a reliable colorant of white oxides and films that are infusible. After receiving a drop of the nitrate and a touch of the flame magnesia becomes pink and alumina blue, and the oxides of zinc, titanium, tin, an-

timony and columbium assume various shades of green.

### **Determinative Characters beyond the Blowpipe**

The blowpipe art is at most an important part of determinative mineralogy. The blowpipe and the blow-lamp, together with the reagents, reveal characters that are chiefly chemical but are partly thermophysical, inasmuch as they include fusibility and the other changes of form, or of color, that heating may induce. These characters of a mineral are collectively termed its pyrognostics. Beyond them physical tests in wide variety are needed to complete the evidence and permit of identification.

The physical characters obtainable without use of heat comprise habit, structure and fracture, lustre, feel and taste, and streak and color, each of which needs only to be observed; crystallization and cleavage, which require study; and hardness and gravity, which must be measured. Oddly enough color, the character naturally first noticed, is rarely distinctive and is usually misleading. When a streak can be shown it is far more indicative than color. Crystallization and cleavage, which would be very informing, are usually absent or concealed.

To ensure that no one be tempted to make idolatrous libation to the blowpipe the indispensability of physical characteristics deserves brief survey. The blowpipe is completely baffled by the chemical—never comical—identities between pyrite and marcasite, rutile and brookite, and calcite and aragonite, but to each problem good crystallization usually provides the clue. Andalusite, sillimanite and kyanite all comprise 63 per cent. of alumina and 37 of silica, but beyond that the blowpipe and chemistry can not help. Having similar gravities and hardnesses these minerals must be differentiated by color and optical properties. Even crystallography helps little, for two are orthorhombic and one triclinic. However, the blowpiper need not confuse the three with dumortierite, the boron content of which should not be missed. Somewhat easier is the differentiation of diaspore,

bauxite and gibbsite—all hydrated alumina by incomplete verdict of the blowpipe. Although gravity would tell nothing, absence of cleavage would announce bauxite and high hardness diaspore. However, if still uncertain one could invoke blowpipe and balance to decide whether the water content approached 15, 26 or 35 per cent. Turgite, goethite and limonite—all hydrous oxides of iron but differing in content of water—present similar problem, though the red streak of turgite is readily told from the yellow-brown of its associates. Again certainty might require measurement of the water content. Mention of streaks recalls that martite and hematite—chemically identical as ferric oxide—yield reds that differ enough, and that graphite and molybdenite, which look like twin sisters, yield streaks on glazed paper that differ as green from gray. Even this discourse may owe some of its smooth sophistry to the graphite streak calling writing. Finally, good taste permits touching the tongue to vitreous minerals, among which halite, trona, soda niter, epsomite, melanterite, and the alums are readily thus identified.

### **Determinative Scheme a Necessity**

It is now clear that very few mineral identifications can be certified on pyrognostics or physical characters alone, and that time would be lost by determining the blowpipe characters before observing the physical qualities that are quickly discernible—or by doing the reverse. In every edition of the **Textbook of Mineralogy** since 1903 Dana has said:

"There is but one exhaustive way in which the identity of an unknown mineral may in all cases be fixed beyond question, and that is by use of a complete set of determinative tables. By means of such tables the mineral in hand is referred from a general group into a more special one, until at last all other species have been eliminated and the identity of the one given is beyond doubt."

Notwithstanding the quoted paragraph none of the editions contains a deter-

minative scheme, although they do tabulate variously by crystallization, hardness and gravity. Dana did devise an excellent scheme, but I have seen it published only in his **Manual of Mineralogy and Petrography**, of which the 12th Edition, dated 1900, presents it in 24 pages. The scheme puts primary emphasis on chemical characters, and hence on blowpipe work. Though the book is out of print, the Dana scheme is probably still available in other form, and its connection with our late honorary member and his illustrious father adds pleasure to the present mention.

A determinative scheme of great merit very early presented to the American student was devised by Brush, of Yale University, and it is still found in the **Manual of Determinative Mineralogy and Blowpipe Analysis**, by Brush-Penfield, of which the 16th Edition, published in 1914, is still sold. Occupying 63 pages, the scheme bases first classification on fusibility, after which the other physical and chemical characters are called for as needed to narrow the field of search.

Akin to Brush-Penfield but far later in date is the **Manual of Determinative Mineralogy with Tables**, by Lewis and Hawkins, of Rutgers. The physical tables occupy 74 pages and the determinative 62, so the content keeps faith with the title. Having latest edition in 1931 the work is the most modern of the kind, and the quality reflects the abilities of both authors, one of them a former president of this Club. Naturally the book can still be bought.

For reasons early apparent to the student no scheme requires determination of characters in one order for all minerals, so the tests earlier described are not used in one sequence, nor do most minerals need them all. The scheme calls for tests in the order appropriate to the mineral at hand, and the wise student follows the scheme, leaps no fences, jumps to no conclusions, avoids imagination of the unseen and observes all that is visible. Shortly after graduation I recall bitter defeat in determination of massive blue sodalite, a chlorosilicate of sodium and aluminum that would have

yielded to systematic attack and observation of showings—no more and no less than was seen. Failure rested on disregard of the sodium flame, which I ascribed to dust on the specimen rather than to the mineral itself. Furthermore, I had worked without means to measure hardness and gravity, thereby courting disaster with a silicate and many another nonmetallic variety.

#### Advantages and Limitations of the Blowpipe Art

Mineral determination excels chemical analysis, whether qualitative or quantitative, in the critical dissection of a mineral mixture and identification of the constituent varieties, with at least an estimate of the proportion of each. A rock specimen supposed to contain cassiterite was lately diverted from an analytical laboratory to my table, where determination showed only chrysocolla, garnet, tourmaline and quartz, without tin. In comparison with this information analysis of the entire rock could have shown percentages of the oxides of calcium, magnesium, iron, copper, aluminum, silicon and boron, likewise without tin—a result having less value and meaning, and taking ten-fold the time. On the other hand, the blowpipe can not make the element separations usual in wet chemistry. The art must always fit the aim. Naturally the blowpipe art is most suitable for determination of the sulphides and arsenides of the metals reducible by flame and carbon, such as zinc, lead, copper, cobalt, nickel and iron, because they can be identified almost entirely by strong and unmistakable chemical characters. Even massive sphalerite, galena, covellite, cobaltite, niccolite and pyrite are notably easy to determine.

Identification of the silicates is far more difficult, because they are mostly light in color, transparent or translucent, very numerous, and similar in appearance and in many decisive physical characters. Unless well crystallized, staurolite, andalusite, kyanite and beryl are quite difficult of determination. Transparent and translucent minerals are more surely and quickly identified by optical characters,

but the equipment is often too costly for the amateur. The blowpipe and physical characters will usually identify a feldspar as one of that great family, but closer classification is seldom possible by these simple means. The tungstates, titanates, columbates and tantalates are extremely difficult for others than experts in the art, and the rare earth minerals are even more puzzling, by reason of the many elements contained in proportions that range widely. The blowpipe and related methods afford valuable help, but they can not replace experience and familiarity with the difficult minerals.

Example of advantages and limitations of blowpipe examination is offered in stream pebbles notably heavy and dark, for examination of which three hours happened to be free. That space sufficed to show the specimen worthy of quantitative analysis, and I requested the laboratory to determine the oxides of tantalum, columbium, titanium, iron and manganese as known constituents. The analysis, totalling 94 per cent., showed all five oxides in amounts ranging from 2 to 32 per cent., in addition to 3 per cent. of tin oxide, for which the special test had not been made. Thus mineralogy and chemistry collaborated, each in its proper way.

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The talk that now hastens toward close of a crowded hour can only mention the fine art of the quantitative assaying of metals by blowpipe methods. They deserve separate though shorter description, and they are capable of interesting associated exhibits. By reason of economy in time and material and of enough accuracy in result they merit continued use. As far as I know, blowpipe assaying has been taught in this country only at

Lehigh University, beginning about 1880 and ending shortly after the passing of Dr. Richards in 1921.

#### **Future of the Blowpipe Art in Mineral Determination**

The few inquiries possible in preparation of this paper leave sharp impression that the American colleges are giving less and less blowpipe instruction in the teaching of determinative mineralogy. Hence the undergraduate student is being taught to identify minerals chiefly by physical characters, and the growth of this practice is shown by the content of three excellent laboratory manuals of mineral determination published within the past decade. The graduate student then learns to determine minerals by applying the microscope to microchemical qualitative analysis, to examination of transparent minerals in plain and polarized light, and to study of opaque minerals by the polarized beam—passing thence to the mysteries of spectroscopic and X-ray examination. A paper on all these things would usefully enlarge our knowledge of modern determinative methods.

In conclusion, the future position of the blowpipe art in mineralogy is beyond my prophecy. It may perish for want of utensils, which are now sold in the smaller variety that the colleges lately require; but as long as procurable a blowpipe kit will afford useful, scientific and pleasant pursuit within monetary reach of all. Should the art survive and should this paper induce participation, your enlarged interest and pleasure in the study of mineralogy will be my sufficient reward. If I have only described a dying art, the tribute of one who loves it may add timely record to the history of natural science.

—H. R. Lee.

## "THE OLD TUNGSTEN MINE IN TRUMBULL, CONN."

By PAUL T. BLATZ

It has long been the aim of Mineralogical Clubs and Societies to stimulate public interest in geological and mineralogical knowledge, also to secure the practical conservation of mineral localities and unusual rock formations.

Located in the Town of Trumbull, a short distance east of where the Monroe Turnpike crosses the Pequannock River, is a rounded knoll, formerly known by the several names of Long, South, or Skag-ne-wamp Hill. This knoll rises about 200 feet above the valley, and the surrounding country is formed of beautiful rolling hills with the Pequannock flowing peacefully at their southerly base.

This tract of land, containing about 60 acres is also known as the "Old Tungsten Mine", with its open cuts, tunnels, pits, and dumps that Dr. Adolf Gurlt of Bonn, Germany visited in 1887, and so ably described to the International Engineering Congress at Chicago in 1893.

W. H. Hobbs (U. S. Geological Survey) describes "The Old Tungsten Mine at Trumbull, Connecticut" and E. V. Shannon (U. S. National Museum) writes of the "Minerals from the Old Tungsten Mine at Long Hill in Trumbull, Connecticut".

J. F. Schairer in bulletin No. 51, on "The Minerals of Connecticut" mentions some fifty minerals to be found at this locality. The pseudomorphs of wolframite (after scheelite) are preserved in all the large museums of the world, and the scheelite crystals were used as illustrations for text-books. The topaz vein produced good crystals, often large, and clear blue topaz of gem quality has been found there. The scheelite fluoresces a beautiful blue under the Ultra Violet Ray, and the fluorite shows either a light blue or a green phosphorescence. All the minerals that Schairer mentions may still be found there.

The Town of Trumbull has acquired this tract of land for a Recreational

Park, and the possibilities there are numerous. The "Old Swimming Hole" is a reality now in the form of a beautiful pool, and baseball and tennis fields are possible. The old paths that traversed the hill surely may be enjoyed by many as they view the pleasing country surrounding them.

The trees, minerals, and rock formations properly labelled should be of interest to our schools and townspeople. A beacon tower, built of natural stone, high on the summit, will allow a view for miles in nearly every direction.

The Town through its Selectmen and Park Commissioner having requested the local mineral club to assist them from the mineral angle and having agreed that portion of the Park, which was formerly worked and exposed during the mining operations, will be left open to residents and non-residents who are interested in Geology or Mineralogy for the study and the removal of specimens, have, in allowing this, rendered a service and distinct contribution to Mineral Clubs and Societies; and perhaps even the colleges will look with favor upon the action that the Town has taken in preserving and beautifying this old locality.

The Town of Trumbull bounds the City of Bridgeport (the industrial capital of Connecticut) on the north, and is divided into three sections, known as: Nicho's, Trumbull Center, and Long Hill. The Park is located in the Long Hill section.

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Since the foregoing article was set up, we have received from Mr. Blatz an announcement of Mr. H. F. Whitney, Commissioner of Parks of Trumbull, relative to placing the Trumbull mine at the disposition of collectors. This will be found on the following page.—Editor.

## Trumbull Park Notice

As part of the plan to most beneficially utilize the valuable possibilities of the new park in Long Hill, (at present known as the Tungsten Mine), that portion of it which was formerly worked and exposed during mining operations, will be left open to residents and to non-residents who are interested in Geology or Mineralogy for the study and removal of specimens.

It is the intention of the Park Board to designate and label the various specimens of particular interest, which specimens will not be subject to removal

or defacement.

As new minerals or formations (not listed in the Connecticut State Bulletin) are found, it is requested that the name, description and any interesting details or comment be furnished to the Park Commissioner, Harold F. Whitney, Long Hill, Connecticut.

Except for the privileges referred to in the first paragraph, the rules and regulations as to the park proper, will apply with equal force.

Approved,

H. F. Whitney, Commissioner.

## PRIZE ARTICLE CONTEST

In the June issue of **Rocks and Minerals** we announced that two generous members of the Rocks and Minerals Association have contributed \$50 to be divided into three prizes for a good, better, and best article on some mineralogical subject. The first prize will be \$25, the second \$15, and the third \$10.

### The rules of the contest are:

Articles must deal with some mineralogical subject with emphasis on popular appeal and general interest yet with some scientific aspect included. For instance, if a locality is described, something of the occurrence as well as a description of the minerals present should be treated. Photos, maps, etc. are not necessary but could serve to make an article more interesting. These should be in shape for publication. All maps, drawings and sketches should be in black ink.

Articles must be typewritten (keep a carbon copy for your files) from 4,000 to 6,000 words in length, and as each will be judged anonymously, the author's name should not appear on it. Have two title pages for each article. On the first type the name of the article and your name and address; on the second title page type only the name of the article. All articles must be sub-

mitted by or before midnight of October 15, 1938.

Address them to

PRIZE ARTICLE CONTEST,  
**ROCKS and MINERALS,**  
PEEKSKILL, N. Y.

**All entrants must be members of the Rocks and Minerals Association.**

No articles will be returned (if not a prize winner) unless a self-addressed stamped envelope is enclosed with it. Furthermore all articles submitted in the contest will be held subject for possible publication in **Rocks and Minerals**.

The judges in the contest are: Dr. Frederick H. Pough of the American Museum of Natural History, O. Ivan Lee, and Arthur Montgomery, all of New York City.

The prize-winning articles will be announced in the January, 1939, issue of **Rocks and Minerals** and published in the early issues of that year.

Other than that the articles should be addressed to **Rocks and Minerals**, this magazine has nothing to do with the running of the contest. All such mail as is addressed to the Prize Article Contest will be turned over to the judges.

## RENO MINERALS CLUB OBSERVES FIELD DAY

By FRED CREULICH

Observing national Rocks and Minerals Field day, members of the Reno branch journeyed to the Mono Crater district in California and enjoyed a very interesting trip. The party started from the Washoe County Court House, known the world over, at 7 o'clock on May 29, and after a drive of about five hours reached the day's objective.

The day was ideal for a field trip and all the members participating in the outing were keen in anticipating the unique phenomena to be seen in this eastern California region about 50 miles southwest of the Nevada state line, where the dead craters of once active volcanoes are found just south of a brackish lake. The remnants of the volcanoes are called Mono Craters while the lake is given the name of Mono Lake.

The objective of the visit was to view these craters and to obtain specimens of the obsidian, pumice and rhyolite known to exist in the immediate region in great quantities. Besides a very interesting geological lesson, the party viewed some of the finest mountain scenery in the entire West.

Leaving Reno the Caravan drove down through Truckee Meadows, past

Steamboat Springs, Slide Mountain, Bowers Mansion, Lakeview Summit, the State capital at Carson City, the Stewart Indian School, Genoa and then into Minden and Gardnerville. About 12 miles beyond Gardnerville the road crosses the Nevada line and enters California.

It may be well here to digress slightly to give a short explanation of the various places mentioned above because they are vitally a part of the western Nevada history. In their order is given the following description:

Steamboat Springs, 12 miles south of Reno, is noted for its natural exposition of mineral deposition. Here, through fissures in the earth's crust, which form channels to subterranean depths, issues boiling hot mineral water. Many geologists have studied these boiling springs with the view of obtaining precise data concerning their characteristics. Many of these scientists assert the mineral waters from beneath the crust carry cinnabar and even traces of gold in solution. From this very interesting fact they conclude that at Steamboat Springs science has a living example of the method of natural ore deposition. Steamboat Springs is really considered



*Reno Rocks and Minerals Study Club Outing, May 29, 1938, at Mono Lake, California. Mono Lake in background.*

as a geyser basin. It is a very popular resort for Reno people. They go to the Springs for swimming and recreation.

Next in order along the way is Slide Mountain, so called because of huge chunks of its granite structure broke off from the main mass many years ago and rolled down with a crashing roar and destructive results into the valley below. As a result a huge white scar marks the southern face of the mass of granite, which forms a part of the Carson Range, which, in turn, is the eastern rampart of the great Sierra Nevada mountains.

A short distance beyond Slide Mountain the caravan came to Bowers Mansion, nestled among the poplars and set closely against the granite mountain which forms its background. The mansion was built in the early Comstock days as a residence for Sandy Bowers, a noted Comstock character who was lucky on the lode and reaped a fortune. This fortune, seemingly, did not lodge long with Sandy, who was generous to a fault, and he saw it dwindle, little by little, until the entire fortune had disappeared, leaving his wife, famed as Eilly Orrum, in Nevada history, to depend upon her art as a crystal gazer for a livelihood for several years before she followed Sandy into the Great Beyond. Strangely enough at Bowers Mansion hot waters also issue forth from fissures. These, however, are smaller in size, and appear in the granite rocks immediately behind the mansion. This water is now impounded and held in swimming pools for use by the general public. The spacious and well shaded grounds adjacent to the Mansion are proving popular picnic grounds for all of northwestern Nevada citizens.

From the front lawn of the Mansion visitors may look out over the extensive Washoe Valley, famed for its zephers and its twin Lakes. Across the ridge of hills along the eastern border of the valley lies Virginia City, the center of activity for the world famous Comstock Lode mining district.

Lakeview Summit, some miles beyond Bowers, separates Washoe Valley from Eagle Valley, at the south end of which

lies Carson City, the state capital.

Just beyond Lakeview Summit, west of the highway, the members of the Rocks and Minerals Study Club, observed, in a rock cut made for a railroad line years ago, an intensely interesting geological phenomena. This consisted of an andesite dike intruding in a granite mass which forms the country rock of the Carson range.

Down the hill from Lakeview Summit, into Carson, passing the state capitol, and other state buildings, the caravan rolled on.

South of Carson City the party, from a distance of perhaps two or three miles, could observe a very pronounced fault scarp, known as the Genoa fault. This escarpment marks the eastern foothills of the Sierra Nevada Range. It is of comparatively recent origin and the effacement near the base of the hills is very definite and shows to be a slip of about 15 feet. At least it looks that small from the highway, but closer approach and a keener observation would show that this scarp is about 30 feet high.

Along this valley highway to the west is located the small town of Genoa. Genoa was the first permanent settlement of Nevada and has a very beautiful setting.

Next came Minden and Gardnerville, twin cities in the lower fertile Carson Valley, centers of supply for an extensive irrigation project. The caravan continued on however and soon came to Topaz Lake. This artificially made lake was created for the purpose of impounding waters to irrigate fertile Smith and Mason Valleys some miles to the east in the Walker river valley. On the southward journey the waters of Topaz were as quiet as a mill pond. On the return trip however, a rising wind had whipped the waters into an almost frothing roughness.

At Topaz Lake we left Nevada and entered California. From this point onward to Bridgeport the road courses through some rugged mountains and lowland scenery. Because the mountain districts of this region were severely bat-

tered with snow last winter, the road was found to be bad on short stretches.

The party next arrived at Coleville which lies at an altitude of 5,150 feet. Approaching Coleville, the escarpment on the base of the front range consists of granite and is very pronounced.

From this point the road roughly paralleled the course of the Walker river which flows out from the Sierras and eastward into the Nevada sagebrush land. Eventually this mountain stream empties its waters into the Lahontan Reservoir, a part of the Newlands Reclamation project in western Nevada. Because of rapidly melting snow in the higher altitudes this stream was almost in flood stage and on all sides could be seen the damage to the highway and forests which the rushing waters earlier in the season had wrought. At one place a giant pine, with a diameter of almost four feet, lay prone in the river bed, roots and all. In some places the highway had been undermined and it was necessary to build small detours around these washouts. However, no difficulty was experienced in getting around these bad spots.

On the ridge east of the Walker river and 1,250 feet above it is the last remnant of the ancient Walker Glacier. Tahoe Stage, and this remnant can be recognized by the large gray boulders of granite resting upon the basic volcanic rocks. Near the bridge over the West Walker river the road cuts show the glaciofluvial gravel, also Tahoe Stage, lying on the rock terraces of basaltic lava and tuff. The low eroded terminal moraine of the Walker Glacier can be seen just beyond it. In the higher slopes to the left of the road the white crags are rhyolitic tuff which is interbedded with the basic rocks and lava.

For the next four miles the party traveled through the glacial beds of the ancient Sherwin Stage, the more recent Tahoe Stage, and the large isolated boulders of the oldest glacial stage found in this region. It is known as the McGee glacial period and the remnants can be seen on summits to the north and northwest.

After passing through the glacial beds we reached Fales Hot Springs and Hotel. Here a large hot spring issues from the ground with water having a temperature of 175 degrees Fahrenheit, with the aid of bright colored algae, the stream is now forming new calcerous deposits. Older deposits of travertine are plentiful on the slope to the left. An interesting incident occurred while the party had stopped at Fales Hot Springs. On benches which appeared to be travertine cliffs, thousands of swallows had filled the air. They had nests in the crevasses of the travertine cliffs.

One and one-half miles beyond Fales Hot Springs, the mountain walls narrow and pinch in toward the highway. At an altitude of 7,480 feet these walls had closed in and there was but a narrow cut through them. This is known as the Devil's Gate. The mountain walls show exfoliation and staining of joint blocks. This has been caused by chemical decay. The notch in the mountain walls appears to have been cut by a large glacier stream which issued from the great West Walker Glacier and ran southwestward into the Bridgeport Basin. The old channel is now buried by later alluvium.

Five miles farther on the Boundry Hills on the right are a greatly eroded moraine of the Sherwin stage. The glacier of that time descended Long Valley from the west. To the north is the Sweetwater Range whose summits are glaciated. These are extremely high mountains having an elevation of 11,650 feet. These mountains consist of pre-Jurassic igneous and metamorphic rocks partly concealed by the gently folded and faulted Miocene volcanics. Bridgeport lies in this immediate region and has an altitude of 8,473 feet. Eight miles beyond Bridgeport the hills to the east are composed of andesite and on the west a large moraine left by a large glacier which descended Green Canyon was observed.

A mile or so beyond, Virginia Creek shows to the right. Its canyon has hard metamorphic rocks, while striated gla-

cial boulders can be found along the creek.

In this region which is lower in altitude than Bridgeport, the party came to the Sherwin glacial detritus and this continued to the summit of the range where we got our first view of Mono Lake in the distance. Mono Lake has an altitude of 6,415 feet and the view from this ridge was superb. It is a soda lake about 155 feet deep. There are no fish living in the waters, but the water does support such life as crustaceans and insect larvae. The larger island in the lake is composed of folded Pleistocene lake deposits. There is another island to the north which is darker in color. It has been recognized as a young cinder cone which resulted from a low flow of basalt. The origin of the lake basin, however, is not known.

To the southeast rises a ridge of gray volcanics which consist of obsidian, pumice and ash. Here the party made its rendezvous for the day, and after cars were parked and the members partook of lunch, the various hobbyists scattered in many directions trying to find the most interesting things to see. Many of the group gathered specimens of the obsidian, pumice and volcanic ash, as well as some specimens of rhyolite which were found in great abundance.

There are several volcanic cones in the neighborhood and straight for these many of the club members directed their foot steps. Of the younger ones of the party, many reached the top and made closer observations of this strange phenomena.

Some of the volcanic flows have well defined craters but the great number of them were jagged glass domes in which the viscous acidic lava was scarcely able to issue beyond the vent.

There are three well defined but steep obsidian flows, and the one on the west side is visible 6 miles south of Mono Lake. These volcanoes are believed to be of Pleistocene age. The low northernmost cone is composed of an obsidian plug surrounded by a collar of lapilli and is believed to be post glacial.

After spending several hours in the neighborhood studying the various formations and gathering samples until the treasure bags were heavy and burdensome, all the members of the party gradually drifted back to the caravan cars for the homeward journey. The distance was about 140 miles and it was almost dark when the party reached Reno, after having spent an intensely interesting day with profitable knowledge of strange geological phenomenon.

Those in the party included: Prof. and Mrs. Walter Palmer, Walter Palmer, Jr., Prof. and Mrs. Wm. I. Smyth, Bobbie Smyth, Mr. and Mrs. Fred Greulich, Richard Greulich, Bernard Greulich, Dr. and Mrs. Rader Thompson, Dr. and Mrs. Lawrence Parsons, Prof. and Mrs. J. P. Puffinbarger, Major and Mrs. Wyatt H. Isbell, John Isbell, Francis Isbell, Mr. and Mrs. F. B. Headley, Miss Echo Loder, Miss Jacqueline James, Mrs. F. B. Bulmer, Miss Frances Humphrey, Miss Matilda Ferretto, Miss Marian Rowan, Frank Garaventa, and William Johnstone.

## QUEBEC ISSUES ANNUAL REPORT

The Department of Mines and Fisheries, which is under the administration of the Honorable Onesime Gagnon, P. C., has recently published Part A of the Annual Report of the Bureau of Mines, consisting of "Mining Operations and Statistics". This publication, as indicated by its title, contains the statistics of the Quebec mineral production and a review of the mining development work performed during 1936. It is a

volume of 166 pages, the text of which is accompanied by plates, maps and other illustrations.

In the last part of the volume, there is a review of the employment, wages paid, and accidents which occurred in the mineral industry, followed by a list of the principal operators and owners of mines and quarries in the Province. This publication may be obtained on request addressed to the Director, Bureau of Mines, Quebec, Canada.

## R. & M. A. OUTING IN SOUTHERN CALIFORNIA

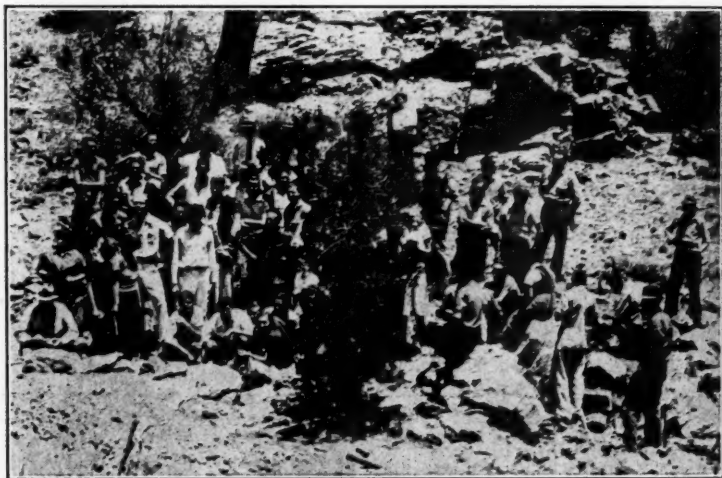
E. V. Van Amringe, Director.

The sixth national outing of the Rocks and Minerals Association, Southern California Branch, was held under the auspices of the Mineralogical Society of Southern California, and led by the latter's president, E. V. Van Amringe, head of the department of geology, Pasadena Junior College.

Eighty persons in twenty-one cars met at the great rock slide at Baldwin Lake in the San Bernardino Mountains at 8:30 a. m. on Memorial Day, the 30th of May, 1938. Many of them had previously enjoyed a day or two camping in the vicinity, swimming, fishing and collecting. After a general description of the day to come and the rock and mineral types worth collecting, Mr. Van Amringe discussed briefly the remarkable physiographic evidence of the various stages of uplift and erosion in the history of the range. The even snow-covered ridge to the south, at an elevation of over 10,600 ft., in which lies Mts. San Geronio and San Bernardino,

represents the last remains of a peneplain of the first cycle of erosion. The broad rolling uplands, including Big Bear Valley in the foreground, elevation 6,700 ft., represents an old-age stage of erosion in the second cycle, while the great gorges cut by the present streams sapping at the flanks of the range are in the youthful stage of the third cycle of erosion. Even traces of the beginnings of a fourth cycle may be noticed in the dissected alluvial fans at low elevations.

At the first meeting point the group selected colorful samples of the Saragossa quartzite (late Paleozoic), which here forms a great talus slope. The rock has been used extensively for decorative masonry throughout the mountain region. The route then lay west and north through Poligüe Canyon into Holcomb Valley. On the divide between Big Bear and Holcomb valleys the Furnace limestone (Carboniferous) is found in a form suitable for polishing. The



*R. & M. A. Outing in Southern California. May 30, 1938.  
Panning gold on the Malcolm & Lewis claim.*

only fossils in the range occur in this rock, but they are of poor quality and very scarce, making the geologic column uncertain, and difficult to compile.

The next point of interest was the old town of Holcomb, where a log cabin is all that remains to remind one of its colorful past. Big Bear Valley was discovered by a band of ranchers chasing marauding Indians in the summer of 1845. They found the region alive with bears, the party of twenty-two lassoing eleven in one day. Then followed a long period when hunters and prospectors roamed the mountains, the latter with little success until the discovery, by William F. Holcomb on May 5, 1860, of a gold-quartz ledge in a beautiful valley two miles north and 600 feet higher. This started a real gold-rush, and within a year over a thousand miners were at work, and the new town of Holcomb missed becoming the seat of San Bernardino County by a margin of two votes. Soon, as usual, the boom burst and the town was depopulated as fast as it had grown. A few old timers remained, however, and the valley has never been completely without permanent residents. The next few miles of our trip eastward passed through extensive placer workings, some still in active operation.

We were next the guests of Messrs. J. H. Malcolm and R. E. Lewis at their claim on the old "Baldwin vein". This great mass of gold-bearing quartz extends for perhaps a half mile, and has only been extensively worked at the Gold Mt. Mine on its east end. Mr. Malcolm kindly demonstrated the art of panning, obtaining a two dollar pan in a few moments, and Mr. Lewis led the group to an old Mexican arrastre and finally to Castle Rock, a great mass of ore assaying up to \$2,300 per ton. Here many of the party obtained "picture rock" of great beauty and value, which provided a pleasant appetizer for lunch.

The old Baldwin or Gold Mt. Mine nearly was especially interesting, not

only for the gold specimens available, but for the method used in its operation. A large glory hole had been excavated about 600 ft. long by 40 feet wide and 50 feet deep along the vein. A 700 foot tunnel was driven 85 feet vertically under this, and connected with the glory hole by a series of winzes or chutes, down which the ore was dropped into cars, and pushed to a 40-stamp mill on the tunnel level some distance away. The mill still stood a few years ago, but now only the ruins remain. This operation was apparently the only unprofitable enterprise of "Lucky" Baldwin.

From the mine a wonderful view of mountain and desert disclosed the route of the remainder of the excursion. The group, anxious to continue collecting, hurried down the slope through the ghost town of Doble and over several low ridges to Horsethief Flat near Smart's Ranch. The garnet locality known to collectors was too difficult of access in the short time remaining, but a new locality for stones of better quality was finally located after several hours of scrambling over the mountainsides. The garnets occurred in a fine muscovite pegmatite and are mainly perfect trapezohedrons and higher modifications. In the meantime nice specimens of travertine and tremolite were found in the limestone.

The route then followed Cushenberry Canyon steeply down to Lucerne Valley in the desert, and thence around the north side of the San Bernardino Mountains to Victorville and home through Cajon Pass. In spite of the destructive washouts of the winter, the roads were all that could be hoped for, and the weather perfect. The total mileage was slightly over 250.

## R. & M. A. OUTING IN CONNECTICUT

New Haven Branch  
Franklin W. Pierce, Director

Sunday morning, May 22nd, it was raining in New Haven. At 9:00 the downpour was so heavy that all members of the New Haven Mineral Club gave up hope of any outing. About 11:00, however, it cleared up and after vainly trying to get together a few members, I finally left alone for the Strickland Quarry at Portland, Conn. There I ran into three members, Prof. Sandiford, Charles Thomas, and Seymour Hall. Mr. L. W. Little of East Hampton, Conn., was also present and he had with him some nice crystals of golden beryl from the Slocum Quarry which we all admired.

The Strickland Quarry had been closed down since last fall so that the dumps yielded but few specimens of interest. We soon left for the home of Mr. Little where we examined his remarkably fine collection of golden beryl. Later he very kindly guided us to the Slocum Quarry where golden beryl was plentiful but not in gem quality.

Hartford Branch  
George Robinson, Director

On May 22 the Mineralogical Club of Hartford held its first annual outing at the Strickland Quarry, Portland, Conn., in cooperation with the Rocks and Minerals Association. Although it rained in the morning it did not dampen the enthusiasm of many of the members as a goodly number and their friends made the trip and found as usual many a fine specimen. At noon, after pictures were taken, lunch was eaten in the shade of trees and then back to the old rock pile the collectors went to resume the hunt for more, new and better specimens.

The club has 30 members and several applications for membership. Regular meetings have been suspended until October. Interest is now centered on field trips. The New Haven club held their outing at Strickland on the same day and many a friendly chat was had with its members. A group from Massachusetts and one from Stamford, Conn., were also present.

## R. & M. A. OUTING IN MARYLAND

C. W. Ostrander and W. E. Price, Jr., Directors.

We would like to report that our Rocks and Minerals Outing was another success this year. Due to recent heavy rains which made certain roads impassible, we were not able to visit all the localities planned.

A party of fourteen left the designated meeting place on the hour. The party first visited the museum of the Natural History Society of Maryland in Druid Hill Park, Baltimore, where the collection of Maryland minerals was viewed. The following localities were then visited and many minerals collected.

Texas, Balto. Co.—In crystalline limestone; tremolite, phlogopite, brown tourmaline, gray scapolite, fuschite, pyrite, sphalerite, and titanite. Blue Mount, Balto. Co. in serpentinized gabbro; calcite crystals, picrolite, deweylite, brucite, chalcadony, drusy quartz, chlorite, and stilbite. Bare Hills Copper Mine, Balto. Co. in hornblende gneiss; chalcopryite, octahedral magnetite, actinolite, hornblende crystals, epidote, talc, and malachite.

We think that the annual Rocks and Minerals Outing is a splendid idea, and we hope that we can help in the program next year.

## R. & M. A. OUTING IN MASSACHUSETTS

Western Branch—John E. Kitson, Director.

The Massachusetts Division of the Rocks and Minerals Association met at the Rollstone Granite Quarry, Fitchburg, Mass., on Sunday, May 22, at 1:00 p. m. Fully 100 collectors were present at 1:00 p. m. but more kept arriving as time went on. Promptly at 2:30 p. m., Prof. W. E. Richmond of Harvard University addressed the entire group which listened very attentively to an able description of the Rollstone granite and its associated minerals. The professor also mentioned the Townsend Granite Quarry, a few miles distant, and of the minerals which may be found in it. At 3:00 p. m., an officer of the

Fitchburg Police Department, lined up the cars (40) and escorted us through the city traffic where other officers held up interference at busy intersections. In due time we arrived at the Townsend Quarry where the remainder of the afternoon was spent.

Good specimens of allanite, biotite, columbite, feldspar, ilmenite, and black tourmaline were found at the Rollstone Quarry. Good specimens of striated magnetite crystals, gemmy microcline, and smoky quartz were found at the Townsend Quarry.

The granite at Rollstone is gray, but at Townsend is pink.

## R. & M. A. OUTING IN RHODE ISLAND

Alonzo Quinn, Director.

In Rhode Island we had heavy rain for the start of the Rocks and Minerals Outing on May 22, but eleven came in spite of the weather. We can always count on Mr. Dennis, Mr. and Mrs. Donnelly, and Mr. Wrathall for these trips.

Our first stop was at Copper Mine Hill where we visited the ancient mines and prospect holes. The minerals collected there included chalcopyrite, pyrite, molybdenite, bornite, malachite,

azurite, magnetite, tremolite, actinolite, epidote, chlorite, and garnet. Our second stop, which was after lunch was at the old granite quarry on "Calumet Hill", the old locality for "Thetis hair stone", hornblende needles in quartz. The quarry has not been worked for many years, but we found a few fragments. The trip was concluded by a short stop at Diamond Hill, where renewed quarrying has exposed fresh material. Nothing new or good was found.

## R. & M. A. OUTING IN UTAH

Junius J. Hayes, Director.

On the day of the outing we set out to visit the Scranton mine which is located about midway between the Mercur and Tintic mining districts. These two famous mining camps are about 40 miles apart and in the Oquirrah Mountains. The Scranton mine is about 60 miles southwesterly from Salt Lake City, and is famous for its beautiful crystallized lead and zinc minerals. When we arrived within about 10 miles of the mine, we ran into roads that were washed out and flooded from severe storms and cloud bursts of the previous night. The roads were washed out for 6 or 8 miles, according to a truck driver who had been in the storms and floods all night

and who had saved his neck but not his truck.

This changed our plans so we headed the seven cars, carrying 35 collectors, back to 5-Mile Pass where we collected many beautiful jasper specimens. A mile south from here we spent three or four hours collecting fossils in a lime rock and shales. Many old Indian hieroglyphics and drawings in 5-Mile Pass proved very interesting.

Mr. John Hutchins of Lehi, Utah, took part of the group to his home to see his superb collection of birds eggs, Indian relics, mineral specimens, etc. So all in all we had a good time anyway.

## R. & M. A. OUTING IN NEW YORK-NEW JERSEY

Peter Zodac, Director.

A cavalcade of forty cars, from six bags, hammers and magnifying glasses. states, carried 120 amateur and professional mineralogists of both sexes to the Andover mines at Andover, N. J., on Sun., May 22nd. The old mine, operated from 1720—to 1880, and now overgrown with brush and trees, has a most interesting history and is noted for a long list of unusual minerals. The ores of the mine were hematite-magnetite but associated with them were galena, chalcopryite, sphalerite, willemite, jasper, etc., etc. Were it not for the rain which fell in the morning, the group of collectors would have been at least doubled.

The first hour or so was spent in getting acquainted with the terrain and the location of pits and dumps. Then, following an interesting talk on the minerals of the old mines (there are two of them close together—Andover and Sulphur Hill) by Mr. James F. Morton. Curator of Paterson Museum, the party swarmed over the old dumps armed with

Soon the sharp tap-tap of hammer against rock was heard throughout the woodland and as "little ones were made out of big ones", Mr. Morton was surrounded by collectors requesting the identifications of unusual specimens.

The most interesting find of the day was terrelite (a mixture of hematite and jasper) and some very fine specimens were found of this blood-red mineral. It should take a beautiful polish.

The Association is deeply indebted to Mr. Harry M. Wildnauer, in charge of the nearby Lake Lenape Office which owns the mine property, for permission to hold the outing at the mine. Mr. Wildnauer was not only present in person at the outing but he was very liberal in pointing out interesting rock formations or in relating the history of the old mine. Furthermore he very cordially invited the group to visit his offices for the purpose of examining the many mineral specimens on display there.



*Part of the group near the old Andover Iron Mine, Andover, N. J.  
R. & M. A. Outing in New Jersey. May 22, 1938.*

## R. & M. A. OUTING IN WASHINGTON

By DON M. MAJOR

The Seattle Gem Club and the Washington Agate and Mineral Society joined in observing the National Outing of the Rocks and Mineral Association on May 21st and 22nd. Sixteen of the former organization and 14 of the latter participated in the trip to the Cle Elum district in search of blue agates and other material.

A few hours drive took the Western Washington groups from the lush vegetation of the Puget Sound region into the semi-desert country east of the Cascades. The group headquartered at a Cle Elum tourist camp, departing bright and fairly early Saturday morning for the Swauk Creek area near the Blewett Pass. At the little mining village of Liberty they secured information about the trail up Crystal Mountain.

Near Liberty, a class of prospectors were learning the intricacies of a radio "doodle-bug", by which mineral was supposed to be located by the reverberation of radio waves. The apparatus responded to the iron in a car, but the gold was still in "them thar hills".

The trip up Crystal Mt. was a 2½ mile hike up forested slopes where a few snow banks lingered. The blue agates, crystals and geodes lay quite thickly on a slope of basalt. Some specimens were in place while others had weathered out of the vesicular formation. The agates were of a pale slate-blue and up to four or five inches in diameter. The banding was often flat, with the top crystallized. Such agates in place were found to have the banding practically horizontal, indicating that little change had occurred in the position of the formation since the deposit was made. Several types of crystals were noted, a few tabular quartz and calcite forms. Some jasper opal was found, mostly of a reddish color. The hikers returned to their cars heavily laden with "plunder".

Late afternoon found the group washing the gravels of Swauk Creek for

gold. Several "colors" were apprehended and one flake of the mineral was found. So far it hasn't been confiscated by the government. The area has been panned, cradled and dredged for over 75 years, and has yielded \$3,-500,000 in placer gold. Mineral found in place is spotty, the formation being a highly metamorphosed Pleistocene slate. Gold is sometimes found filling fossil forms, such as fish and frogs.

Sunday found the group scurrying over the sage brush plains in search of the blue agates that seem to have been washed down from the nearby mountains. The specimens in general were smaller, more water-worn and of a deeper blue than those found on top of the mountain. Some common opal was found but of a poor quality. The rock hunters were at the best season to admire the wild flowers that blanketed the landscape with yellow gaillardias, lupines, phlox, iris, and rock roses. Several of the group supplemented their finds of rocks with specimens of plants from the arid land and the high mountain slopes.

The return trip thru the Snoqualmie Pass revealed rugged snow-patched mountains, glowing with the afternoon sun, and rising from fir-clad slopes and valleys of misty blue. It was a fitting close for a very successful observance of the 6th National Outing in the Pacific Northwest.

## Bjarebys To Tour Northern Europe

By the time this issue comes out, Mr. and Mrs. Gunnar Bjareby of Boston, Mass., will be on the high seas, eastward bound for Europe. They expect to spend three months touring Norway, Sweden, and Finland—visiting museums, mines, quarries, and mineral localities.

On their return to America, they may have an article for **Rocks and Minerals**, covering the high lights of their trip. They are both members of the Rocks and Minerals Association.

## THE AMATEUR LAPIDARY

Amateur and professional lapidaries are cordially invited to submit contributions and so make this department of interest to all.

### THE ART OF THE LAPIDARY

"Old Bill", one of our old subscribers and gem cutting enthusiast, has agreed to write several articles on this subject. He prefers, however, not to write under his own name. He is a man of long experience and is expertly qualified to give you first hand information.

The art of cutting and polishing gems is very old indeed. Much has been written concerning the lure and romance of gems but practically nothing has appeared in English describing the practices and technique of the art. Frankly there has been little progress made in the art during the last one hundred years. The cut shown below and those which may appear in following articles are of machines made seventy-five years ago. The machines used then are still being used today most satisfactorily. In those days no electric power was available; hand power had to drive machines.

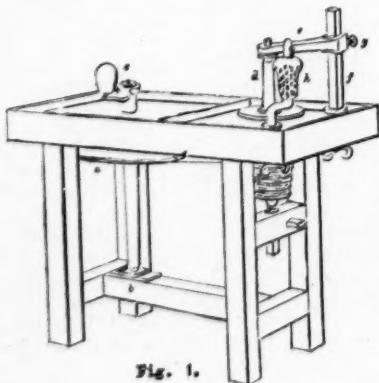


Fig. 1.

The lapidary's bench consists of a stout plank, about three feet, six inches long, and one foot nine inches wide, supported upon a frame about two feet six inches high; the top is divided into two unequal compartments, and the whole is surrounded by a rim of about two inches above the face of the bench, intended to catch the waste emery and water thrown off by the centrifugal force. The compartment to the left hand is about two feet long, and has a central hole fitted with a collar, through which passes the vertical spindle of the driving-wheel *a*; the lower end of the spindle is made conical, and fits into a corresponding centre *b*, fixed in the longitudinal rail of the frame. The driving-wheel, about eighteen inches diameter, is fitted on the spindle between flanges, and works just beneath the under surface of the bench-top, which nearly conceals it, and a horizontal handle *c*, of about six inches radius, is fitted on the upper end of the spindle. The distance between the spindle of the driving-wheel, and that of the lap or mill, should not exceed about one foot nine inches, in order that the arms may not be inconveniently extended, when the hands are respectively applied to the wheel and mill.

The right hand compartment of the bench is about sixteen inches wide, and through a hole in the centre is passed the spindle *d*, that carries the mill; this latter is usually about eight or nine inches diameter, and revolves about one inch above the surface of the bench. The spindle is about eighteen inches

long, and the mill is held between a flange and screwed nut, about twelve inches from the lower end, which is made conical, and received in a corresponding centre, capable of adjustment for height, in order to compensate for irregularities in the lengths of the spindles, and also to allow of the mill being more or less elevated above the face of the bench, according as the edge or side of the mill may be employed at the time. In the bench represented in the figure, this centre consists of a square wooden rod, passing through a mortise in the transverse rail of the frame, and retained at any desired height by a side wedge; but frequently the centre is supported upon the middle of a transverse bar moving at the one end on a pivot in the back upright of the frame, and supported in the front by a wedge.

The upper end of the spindle is also made conical, and likewise works in a wooden centre, which is screwed into a hole near the extremity of a horizontal iron arm *e*, that slides upon a perpendicular bar *f*, fixed behind the mill; the height of the horizontal bar is adjusted to suit the height of the spindle, and is retained in the proper position by the binding-screw *g*. The pulley, about four inches diameter, is fixed on the spindle to work just below the bench-top, the hole through which is sufficiently large to allow the pulley to be passed through, either in exchanging the mills, or when they are required to be elevated.

The support shown at *h*, placed a little to the right and in advance of the lap, is called a gim-peg, or germ-peg; it is about eight inches high, and made of a round rod of iron bent into a crank form, and fitted with a flange that bears upon the surface of the bench; the lower end of the rod passes through a hole or mortise in the bench, and is fixed by a wing-nut beneath, in order to allow of the gim-peg being twisted round to different positions, according to the distance it is required to be placed from the mill.

The gim-peg serves as a support for the arm of the workman in grinding the edges of small stones, but its principal use is to serve as a guide for the vertical angle in cutting facets; for this purpose a wooden socket, of the form shown in the figure, is slipped over the upper part of the rod, and retained in its position by a wedge driven in between the iron stem and the hole in the wooden socket. Several series of holes, or rather notches, one above the other, are arranged around the sides of the socket, and which serves to determine the inclination of the stick upon which the stones are cemented, as will be hereafter explained.

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## U. S. Borehole Beats Africa's

Under the heading "World's Deepest Borehole," printed on page 207 of our July issue, it was stated that a borehole in South Africa had been sunk 10,718 feet, the greatest depth to which a drill had ever been sunk. The information for this statement came from a South African magazine which had just reached our desk and, assuming its accuracy, we printed it as an interesting item. A letter from the California Division of Mines calls our attention to the article and to a deeper hole drilled in their State by the Continental Oil Co. near Wasco, Kern Co., Calif. The company ceased drilling in their K. C. L. No. A-2 well at 15,004 feet and today are producing oil from that well at an approximate depth of 13,092-13,175 feet. We are grateful for this correction, as we desire accuracy in the articles appearing in **Rocks and Minerals**. It is also gratifying to know that the United States, whether on the earth, above the earth or beneath its surface is still ahead.

## THE PLAINFIELD MINERALOGICAL SOCIETY

Twelve enthusiastic mineralogists met at the home with Thomas A. Wright of 1161 Stillman Ave., Plainfield, N. J., on the evening of Tues., June 7, 1938, and organized the Plainfield Mineralogical Society. It is interesting to note that these thirteen gentlemen were not all from Plainfield but that Westfield, Scotch Plains, New Brunswick, Watchung, and Jersey City had representation in the new club.

Thirteen is a very lucky number to start with because if there wasn't 13 we could never have more than 12 and as several others were expected at the meeting but were detained for one reason or another the membership has probably increased by this time.

In perfecting the organization, Dr. Alfred C. Hawkins was the unanimous choice for President but he declined because of pressure of business matters. He was, however, persuaded to accept the office of Honorary President offered him.

The other officers of the club are: Thomas A. Wright, President; Joseph D'Agostino, Secretary-Treasurer; O. Ivan Lee, Chief Scout.

The club very wisely accepted Mr. Wright's suggestion that for the present meetings could prove more interesting if held at the homes of various members rather than at a central meeting place.

It was decided that indoor meetings would be held on the first Wednesday

of each month beginning with October and ending with May. From June through September, the club would hold a monthly field trip at some designated time and place.

W. L. Blackader, A. C. Hawkins, R. B. Sosman, and A. McLelland were appointed a committee upon programs and meetings.

Notices of the club's organization were directed to be sent to the **American Mineralogist** and **Rocks and Minerals**.

Much interest was added to this first meeting by Dr. Hawkins who explained the many and various sources of available minerals in the vicinity of Paterson and stated he would be glad to advise as to how they could be reached and would render all possible assistance to make the club a success.

Mr. Lee also discussed at length the numerous localities which he has visited and with which he is familiar.

The club, therefore, is looking forward to some very pleasurable and profitable outings. The first field trip was tentatively set for Sun., June 19th, at Bedford, N. Y.

After the organization of the club, Mr. Wright proved a most wonderful host, delighting those present with a discussion of specimens particularly of some recent additions to his collection from Franklin, N. J.

## EDITORIAL NOTICE

Mr. H. R. Lee, the author of the essay appearing on pages 227-235 of this issue, is a native of New Brunswick, N. J., a graduate of Rutgers College in chemistry and of Lehigh University in electrometallurgy. He studied mineralogy, crystallography and blowpipe determination at both institutions—at Rutgers under Dr. Albert H. Chester and Mr. William S. Valiant, and at Lehigh under Drs. Benjamin W. Frazier and Joseph W. Richards. Since leaving Lehigh in 1906 he has specialized in electrometallurgy,

especially as practiced in the electric furnace. Inasmuch as rocks and minerals are the raw materials of metallurgy he has had lifelong interest in the mineral industries and their products.

In addition to degrees both scientific and engineering the author holds membership in Phi Beta Kappa and Tau Beta Pi and has active interest in the advancement of engineering education. He is a vice-president of New York Mineralogical Club and has lately joined Rocks and Minerals Association.—EDITOR.

